MIMAP Bangladesh

Micro Impacts of Macroeconomic and Adjustment Policies in Bangladesh

Technical Paper No. 03

Decomposing Wage Inequality Change in Bangladesh: An Application of Double Calibration Technique

Bazlul H. Khondker
Mustafa K. Mujeri

Bangladesh Institute of Development Studies (BIDS)
7, Agargaon, Sher-e-Bangla Nagar, G.P.O. Box : 3854
Dhaka-1207, Bangladesh. Web site : www.bids-bd.org

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Mustafa K. Mujeri

Associate Professor, Department of Economics, University of Dhaka, Bangladesh.
Visiting Fellow and Project Leader, MIMAP-Bangladesh, Bangladesh Institute of Development Studies, Dhaka.

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E-17 Agargaon, Sher-e-Bangla Nagar
Dhaka – 1207
Bangladesh.
Tel: 9143441-8
Fax: 880-2-8113023
E-mail: dg_bids@sdnbd.org
Web site: www.bids-bd.org

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Decomposing Wage Inequality Change in Bangladesh: An Application of Double Calibration Technique

1. Introduction

With many roots and multidimensional characteristics, all channels of reducing poverty are important in Bangladesh. For the purpose, the anti-poverty policies and institutions, along with measures for increasing income, require that non-income deprivations are also addressed.[1] Within the framework, one of the key elements, however, is to reduce income poverty which also contributes to enhancing the poor's capacity to meet other deprivations. For increasing income, the access by the poor to decent and productive employment is the major route in a labour-surplus economy like Bangladesh. With the dominance of the rural economy and the informal sector, two broad avenues play significant roles in expanding employment in the economy and strengthening its poverty reduction role: (i) wage employment and real wage increases (resulting from rising labour demand and/or labour productivity); and (ii) self-employment generation and enhanced productivity and better terms of exchange of the produced outputs. The increase in wages has significant poverty implications since most of the poor have labour as the only resource and their major source of household income is wage labour in agriculture and non-agriculture activities.[2]

Along with promoting a pro-poor economic growth which increases the labour's share in national income, an important consideration from the poverty perspective in Bangladesh is to see how the increased income is being shared by different groups.[3] A rising income inequality between the urban and rural areas and among different skill categories of labour has strong implications for poverty in the country as the skilled workers tend to concentrate in urban locations while the unskilled labour, who form the vast majority of the poor, dominate the rural (mostly agriculture) sector. The issue has received added attention in recent years since, despite relatively slow growth, Bangladesh experienced a rise in income inequality in the 1990s both across different sectors and between rural and urban areas. The

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[1] This requires a comprehensive approach to ensure that the poor are able to get better access to a broad asset framework: physical assets to increase productivity and primary income; human assets to enhance capabilities; financial assets to undertake productive livelihood options; natural assets to ensure sustainability and diversity of income streams; social assets to enhance networking capacity and manage extra-market activities; cultural assets to improve status and entitlements; and political assets to strengthen voice and bargaining power and ensure fair access to decision making, resources and public services.

[2] A recent survey indicates that agricultural and non-agricultural daily wages respectively constitute 33 per cent and 15 per cent of the incomes earned by poor rural households in Bangladesh. See BBS 2000.

[3] It is argued that increased income inequality dampens the impact of growth on poverty so that poverty reduction 'opportunities' are lost. See Bruno et. al. 1998, Ravallion 1997.

period was also characterized by significant trade liberalization and opening up of the economy in response to the policy of transition from a protected and state-controlled regime to a liberalized and market-driven economy. In promoting such policies, the potential benefit of liberalization in accelerating growth was highlighted while their impact on poverty remained largely unexplored. Moreover, contrary to the expectations of increased labour demand especially in the formal sector, the outcomes (and the gains to the poor) in the past seems to have largely been determined by the nature and functioning of the labour market in the country. The benefit to the poor in terms of positive impact on unskilled wages could not be fully realized as the production of tradable goods did not use unskilled (or least skilled) labour as the most intensively used factor. As a result, wages of skilled and semi-skilled workers increased relatively fast widening the differential between agricultural (unskilled) and non-agricultural wages. Notwithstanding the influence of trade reforms, there exist other factors (e.g. technological changes) which also had significant impact on changes in wage inequality during the period. From a policy perspective, it is important to identify the relative contribution of trade and other factors in observed changes in wages of skilled and unskilled labour and design appropriate measures to address the issue of widening 'quality divide' in the labour market.

In the paper, a double calibration general equilibrium methodology has been used to decompose observed wage inequality into constituent elements that can be attributed to each of the two sources – trade and technology. For the purpose, we have followed the methodology adopted by Abrego and Whalley (2000) which differs from the traditional general equilibrium approach in two significant ways. First, it decomposes an observed (*ex post*) change between two periods into components rather than the usual approach of analysis through computing *ex ante* counterfactual equilibria. The methodology also recognizes that the component influences need not and typically will not be additive. Second, the analysis adopts a multiple period (e.g. two-period) rather than a single period calibration. Since the methodology requires the model parameterization to be as consistent as possible with observed changes, the base year calibration alone is not considered adequate. This has been termed as a 'double calibration' where the model is fitted to both initial and terminal period data.

For our purpose, the technique has been applied to a component decomposition of observed increase in wage inequality between 1985 and 1996 in Bangladesh. The model and

the techniques applied in the paper suggest that, within a general equilibrium setting, other factors such as changes in factor supply and different forms of technical change have significant roles in explaining changes in wage inequality in the country.

2. Poverty Profile and Labour Market in Bangladesh

The interfaces of trade reforms and technological changes with poverty are governed by the complexities of the pathways through which the changes in the labour market and wages affect different socio-economic groups. The impacts also vary depending on the ability of specific groups to respond to such changes. A brief review of the poverty profile and characteristics of the labour market in the country will provide some evidence on the nature and extent of changes in wage rates across different labour categories and the factors behind such movements.

2.1 Trends in Income Poverty

The incidence of income poverty during the 1990s is given in Table 1.[4] Between 1991/92 and 2000, the incidence of national poverty declined from 59 per cent to 50 per cent,

Table 1

Trends in Poverty and Inequality in the 1990s

	Per cent		Change per year (per cent)
	1991/92	2000	
Head count Ratio			
National	58.8	49.8	-1.8
Urban	44.9	36.6	-2.2
Rural	61.2	53.0	-1.6
Poverty Gap			
National	17.2	12.9	-2.9
Urban	12.0	9.5	-2.5
Rural	18.1	13.8	-2.8
Squared Poverty Gap			
National	6.8	4.6	-3.8
Urban	4.4	3.4	-2.7
Rural	7.2	4.9	-3.8
Gini Index of Inequality			
National	25.9	30.6	2.1
Urban	30.7	36.8	2.3
Rural	24.3	27.1	1.4

Source: BBS 2001.

[4] The poverty figures are based on consumption expenditure data as consumption is considered to be a better indicator of permanent income status in a country like Bangladesh. The incidence of poverty prior to the 1990s is not provided due to non-comparibility of available estimates. The available figures, however, indicate very little progress in poverty reduction in the 1980s. According to one estimate, the head count ratio remained stagnant at around 59 per cent between 1983/84 and 1991/92. See World Bank 1998.

indicating a modest reduction rate of 1 percentage point per year. The declining trend, moreover, is robust to the choice of poverty measures like the poverty gap and the squared poverty gap. The results show that the progress in reducing the head-count index has been better in urban areas although more than 85 per cent of the poor live in rural areas. The rural areas displayed better progress in reducing the depth and the severity of poverty, as captured by trends in poverty gap and squared poverty gap respectively. In case of inequality, however, the Gini coefficient increased considerably during the 1990s with the urban inequality rising faster than the rural inequality.

Despite the fact that the poor have substantial heterogeneity in terms of socioeconomic and other characteristics such as physical and human resource endowments and nature of occupation and employment, poverty incidence is higher among those who possess little or no land and depend on wage labour for their livelihood. As a result, the agricultural labour households have a high incidence of poverty as do non-agricultural casual and relatively unskilled workers (Table 2). The high incidence of poverty among the labour households indicates low returns to labour along with several specific features of the labour market and employment pattern in the economy.

Table 2

Poverty Incidence among Labour Households, 1999

Main occupation of household head		Head count index (%)	
		Urban	Rural
A.	**Agriculture**		
	Wage labour (with some land)	68.5	61.4
	Wage labour (landless)	85.3	70.8
B.	**Non-agriculture**		
	Wage labour		
	Production workers	60.7	60.9
	Garments workers	60.0	55.0
	Construction workers	62.2	51.9
	Transport workers	53.5	41.5
	Other workers	78.4	63.5

Source: BBS 2002.

2.2 Labour Force and Employment Pattern

During the 1990s, labour force in Bangladesh increased rapidly from 51.1 million in 1991 to 60.3 million in 2000 indicating an annual growth rate of 1.9 per cent. In other words, around 1 million people have entered the labour force annually and, with the current demographic growth, the trend is likely to continue for the next two decades even if the present declining trend in fertility continues.[5]

The sectoral pattern of employment reveals the dominance of agriculture (Table 3). The changes in the distribution of activities in the non-agricultural sector reveal two striking developments: (i) decline in the share of employment in the manufacturing sector; and (ii) shift in labour force to non-agricultural activities mostly in the service sectors.[6] The changes in the employment pattern are also characterized by a very high level of informal sector employment, employing more than 80 per cent of the employed population over 15 years. In

Table 3

Employed Persons by Major Industry

	1989	1990/91	1995/96	1999/00
Total (million)	50.1	50.2	54.6	58.1
		Share in per cent		
Agriculture	65.1	66.5	63.2	62.3
Manufacturing	14.0	11.8	7.5	7.4
Construction	1.2	1.0	1.8	2.1
Transport, storage, communication	2.5	3.2	4.2	4.6
Trade, hotel, restaurant	8.2	8.6	11.2	12.0
Community, personal services	3.6	3.8	9.3	7.4
Household sector	4.8	4.6	2.2	2.6
Other industries[1]	0.6	0.5	0.6	1.6
Total	100	100	100	100

[1] Other industries include mining, electricity, gas and water, finance and business services.
Source: Labour Force Suveys, various years.

[5] A major factor in expansion of the labour supply is the growth of working age population. Since 1991, the working age population aged 10 years and over has grown by 2.5 per cent per year although the labour force participation rate has declined from 69.6 per cent in 1991 to 65.8 per cent in 2000. During the period, the rural labour force increased by 22 per cent (1.6 per cent per year) while the labour force in urban areas increased by 37 per cent (2.8 per cent per year) indicating the effects of rapid urbanization and rural-urban migration.

[6] The declining share of manufacturing employment (which indicates that around 3 million people left the sector between 1989 and 2000) is somewhat paradoxical since the manufacturing value added grew at an average rate of around 7 per cent per year during the same period. An examination of the disaggregated data indicates that a significant part of the decline in manufacturing employment can be attributed to a change in classification of female (mostly unpaid family) workers processing food and beverages. While earlier classification put them as manufacturing unpaid family worker devoting to household economic activity, the later surveys classified them as agricultural unpaid family workers.

other words, almost 42 million people were engaged in the informal sector in 2000.[7] The distribution of the working labour force by status also reflects the dominance of informal arrangements (Table 4). In 2000, more than 32 per cent were self-employed compared with less than 27 per cent in 1991 largely due to rapid increase in service sector employment.[8] The number of unpaid family helpers was around 21 million in 2000 with its share declining from 47 per cent in 1991 to 37 per cent in 2000. A major change, however, is the significant increase in the number of people receiving a wage (either daily or salaried). The proportion of regular employees in the labour force remains modest at 13 per cent while the share of day labourers is nearly 18 per cent (compared with less than 14 per cent in 1991). The employment status of women differs significantly from that of men with nearly three-quarters of employed women working as unpaid family members.

Table 4

Employment Status of the Labour Force, 2000

	Both sexes		Male		Female	
	No. (million)	Share (per cent)	No. (million)	Share (per cent)	No. (million)	Share (per cent)
Self-employed	18.75	32.3	16.47	45.6	2.28	10.4
Employer	0.10	0.2	0.09	0.3	0.01	0.1
Employee	7.72	13.3	5.57	15.4	2.15	9.8
Unpaid family member	21.28	36.6	5.34	14.7	15.94	72.6
Day labourer	10.22	17.6	8.66	24.0	1.56	7.1
Total	58.07	100	36.13	100	21.94	100

Source: BBS 2002.

[7] As in other developing countries, Bangladesh's labour market is characterized by the co-existence of formal and informal segments. In the formal sector, employment relationships are contractual and governed by labour laws and regulations. As a result, wages in this 'protected' sector are usually higher and the jobs are more secure. In the informal sector, wages are unprotected and jobs are far more insecure than in the formal sector. In many respects, the informal segment is considered as the residual of a distorted labour market where labour unions, minimum wages and various government regulations push wages in the formal sector to higher than equilibrium levels rationing a part of the workers into the 'inferior' informal sector. In any case, the informal sector dominates most industries in Bangladesh except the energy sector (gas, electricity and water) and finance and business services. In 1996, the proportion of the informal sector (both rural and urban) was 87 per cent of the total employed population in the country.

[8] The service sectors employ the largest proportion of the self-employed. For example, more than 70 per cent of the workers employed in transport and trade sectors are self-employed.

Despite the overall increase in the level of employment during the period, significant imbalances in the labour market exist. The total labour force increased from 51.2 million in 1991 to 60.3 million in 2000 (that is, by nearly 18 per cent). Over the same period, the number of employed persons increased by about 16 per cent – from 50.2 million to 58.1 million. This indicates that the unemployment rate nearly doubled during the period from 1.9 per cent to 3.7 per cent.[9] A more serious concern, however, is the high rate of underemployment.[10] The problem of underemployment reflects the fact that more than 35 per cent of the employed labour work less than 35 hours a week, a low level for a developing country such as Bangladesh. At the end of the 1990s, around 39 per cent of the total labour force were either unemployed or underemployed. Moreover, the rural labour and the female workers suffer more from underemployment. In rural areas, the underemployment rate was nearly 39 per cent in 2000 compared with 21 per cent in urban areas. Similarly, the underemployment rate was estimated at 72 per cent for the female workers whereas it was only 13 per cent for the male labour force. The educated people suffer less than the others do from underemployment since they are seldom employed as unpaid family members which category faces the highest underemployment rate (74.6 per cent) compared with self-employed (16.4 per cent), employer (31.1 per cent), employee (7.8 per cent) and day labourers (9.5 per cent). As a result, the underemployment rate is relatively high in agriculture and for the female workers (who are overwhelmingly dominated in the unpaid family member category) in contrast with manufacturing and service sectors (Table 5). The existence of significant underemployment, along with the relatively low female participation rate (the female participation rate for persons aged 10 and above, as per the usual definition, was only 22.8 per cent compared with 73.5 per cent for the males in 2000), suggests that there exists significant 'surplus labour' in the country.

[9] A person of age 10 years and over is considered as unemployed if he/she did not work at all during the preceding week of the survey (even an hour) and was actively looking for work or was available for work but did not work due to temporary illness or because there was no work available. While the above definition conforms to the recommendations of the ILO, the low rate is usual in a country like Bangladesh since everybody has to find some work (even for few hours per day) in order to survive and maintain his/her family. As a result, the inefficiency of the labour market is not reflected in this standard unemployment rate.

[10] The state of underemployment is the condition in which a person's employment is considered inadequate in terms of time worked, income earned, productivity or use of his/her skills, and the person is looking for additional work in conformity with his/her skill to increase income. Underemployment is currently measured in Bangladesh only on the basis of hours worked. Any person working less than 35 hours during the reference week is considered as underemployed.

Table 5

Underemployment Rate by Major Sectors, 2000

	Underemployment rate (per cent)
Agriculture	46.0
Mining	54.8
Manufacturing	20.7
Energy	11.9
Construction	6.6
Trade, hotel, restaurant	15.6
Transport	7.6
Finance	6.6
Community and personal services	22.3
Household services	27.5
Total	35.4

Source: BBS 2002.

2.3 Education, Skill Achievement and Wages

The level of education and achievement in basic skills is strongly related to the productivity and earnings of the labour force. With increasing access to educational opportunities over the years, the educational profile of the labour force has improved in Bangladesh providing better potential for skill development. This is reflected in the fact that the share of the labour force with no education declined from 58 per cent to 49 per cent between 1991 and 2000. During the period, the proportion of the labour force with basic schooling (grades 1 to 5) increased from 21 per cent to 25 per cent while the share of the employed labour with secondary education (grades 6 to 10) increased from 12 per cent to 16 per cent. The overall literacy rate of the labour force, however, still remains low at 49 per cent in 2000. This is particularly low amongst the rural (46 per cent) and the female (39 per cent) workers. The level of education of the employed persons (15 years and over) by industry reveals the concentration of workers with no education in several areas e.g. agriculture, mining, construction, transport, and household services (Table 6). Moreover, the percentage of the labour force that attended a course in the vocational training system remains extremely low relatively to the labour market needs. During 2000, only 3 per cent of the employed labour had attended a training course with most of them employed in agriculture (39 per cent), community services (18 per cent) and the manufacturing sector (12 per cent).

Table 6

Level of Education of Employed Labour by Industry, 2000

	% of the labour force with					
	No education	Grade 1-5	Grade 6-10	Secondary/ Higher Secondary Certificate	Graduate and above	Total
Agriculture	57.0	25.2	13.5	3.6	0.7	100
Mining	62.4	19.5	11.5	5.0	1.6	100
Manufacturing	39.7	30.0	20.6	7.0	2.7	100
Energy	23.1	13.4	22.5	26.9	14.1	100
Construction	48.2	24.5	14.6	5.9	6.8	100
Trade, hotel, restaurant	32.3	27.6	25.9	10.9	3.3	100
Transport	54.9	27.1	11.8	4.0	2.2	100
Finance	12.7	7.5	11.3	30.6	37.9	100
Community services	22.5	15.1	22.0	21.9	18.5	100
Household services	57.9	18.1	13.0	6.4	4.6	100
Total	49.4	24.8	16.1	6.5	3.2	100

Source: BBS 2002.

As a labour abundant economy and with the existence of significant imperfections in the labour market, the trends in wages reveal substantial differentials across sectors and different skill groups. The average wages for skilled workers in the manufacturing and construction sectors and the unskilled agricultural labourers are given in Table 7. In 1998/99, the wage rate of a skilled worker in the construction sector was 50 per cent higher than the wage rate of a skilled manufacturing worker. This, however, reflects a declining differential between the skilled workers of the two sectors which was more than 70 per cent in 1984/85. But, the striking feature is the increasing gap between the wage rates of unskilled agricultural labourers and the skilled manufacturing and construction workers. During 1984/85, a skilled worker in the manufacturing and the construction sectors received 1.28 and 2.19 times the daily wage rate of an unskilled agricultural worker respectively. This differential reached 2.35 and 3.52 respectively during 1998/99.[11] In effect, the workers employed in the agriculture sector are paid less than in any other sector of the economy.[12] The low level and the slow pace of growth of agricultural wages have been largely due to the relatively high level of unemployment and underemployment recorded in the agriculture sector.

[11] Unfortunately, the available data provide incomplete information on trends about wages in the services sector and in the garments sector where most of the employment has been created during the 1990s. These, therefore, have not been considered.

[12] During 2000, the average daily wage in agriculture was Tk. 50.70 compared with Tk. 69.50 in manufacturing sector, Tk. 65.60 in trade, restaurant, hotel, and Tk. 74.30 in transport sector. Substantial gender difference also exists; males earn around 60 per cent more than females when they are daily labourers. See BBS 2002.

Table 7

Wage Differential between Skilled and Unskilled Labour

		1984/85	1989/90	1995/96	1998/99
1.	**Wage rate (Taka/day)**				
	Skilled manufacturing workers	31.32	58.51	77.60	98.46
	Skilled construction workers	53.44	103.85	119.62	147.62
	Unskilled agricultural workers	24.45	31.35	37.33	41.88
2.	**Ratio: Unskilled/Skilled**				
	Manufacturing	0.78	0.54	0.48	0.43
	Construction	0.46	0.31	0.65	0.28

Source: BBS 2001.

Regarding changes in the relative share of total wages of the skilled and the unskilled labour in total wage payments in the economy and associated wage inequality (wL as against w), data limitations do not permit us to draw any firm conclusions. Some evidence, however, can be used to ascertain the broad trends. Using information on educational qualification of the employed labour force and assuming that labourers with no education and having primary schooling (grade 1 to 5) constitute the unskilled category, the trends in relative shares during the 1990s are given in Table 8. The results indicate that, while the share of skilled labour in total employed labour increased from 21 per cent to 26 per cent in the 1990s, its share in total wage income increased rapidly from 42 per cent to nearly 51 per cent indicating widening income (wage) inequality between the skilled and the unskilled labourers.[13]

Table 8

Relative Share of Skilled and Unskilled Labour in Employment and Income

	1990/91	1995/96	1999/00
Total employed labour (million)	50.2	54.6	58.1
Share (per cent):			
Skilled	21.1	22.8	25.8
Unskilled	78.9	77.2	74.2
Share in total wage income (per cent):			
Skilled	42.3	43.8	50.5
Unskilled	57.7	56.2	49.5

Source: BBS 2002.

[13] Due to non-availability of data, changes since the 1980s could not be analyzed. Some evidence from the input-output tables for the years 1986/87 and 1993/94, however, indicates similar trend. In terms of full-time equivalence, the share of skilled labour in total labour increased from 38.2 per cent in 1986/87 to 43.3 per cent in 1993/94. In the case wage income, the share of skilled labour increased at a more rapid rate constituting 63 per cent of the total wages in the economy in 1993/94 compared with 48 per cent in 1986/87.

2.4 Trends in Productivity and Employment

The growth performance of the Bangladesh economy has been modest since the 1980s despite some increase in annual GDP growth to around 5 per cent in the 1990s (compared with less than 4 per cent in the 1980s). In terms of value added, the share of agriculture declined while the non-agricultural sectors expanded their shares (Table 9). The share of agriculture in GDP declined from 31 per cent in 1985/86 to less than 26 per cent in 1999/00 while its average contribution to GDP growth was about 18 per cent during the period. On the other hand, the contribution of industry and services to GDP rose and these two sectors explained most of the growth in GDP during the 1986-2000 period – 32 per cent for the industry and more than 50 per cent for the services sector.

Table 9

Value Added and Employment Characteristics of the Bangladesh Economy

A. Value added as % of GDP and employment as % of employed labour

	1985/86		1990/91		1995/96		1999/00	
	Value added	Employ-ment	Value added	Employ-ment	Value added	Employ-ment	Value added	Employ-ment
Agriculture	31.15	57.14	29.23	66.39	25.68	63.25	25.58	62.31
Industry	19.12	12.13	21.05	12.97	24.87	9.57	25.70	10.33
of which:								
Manufacturing	11.93	9.88	12.90	11.81	15.43	7.48	15.40	7.40
Services	49.73	30.73	49.72	20.64	49.45	27.18	48.72	27.36
Total	100	100	100	100	100	100	100	100

B. Average annual growth in value added (%)

	1986-1991	1991-1996	1996-2000	Average contribution to GDP growth, 1986-2000 (%)
Agriculture	2.43	1.81	4.88	17.66
Industry	5.43	7.39	6.44	31.91
of which:				
Manufacturing	5.09	7.90	5.59	18.56
Services	3.67	4.57	4.81	50.43
GDP	3.56	4.43	5.21	...
Per capita GDP	1.40	2.43	3.56	...

Note: Value added and growth rates are calculated at constant 1995/96 prices.

Source: BBS 2000, 2001.

However, the changes in employment was slow compared with the changes in the structure of production. During 1999/00, more than 62 per cent of the employed labour were still engaged in the agriculture sector (which increased from 57 per cent in 1985/86 to 66 per cent in 1990/91 and thereafter declined at a slow rate). This shows that, although the non-

agricultural sectors contributed more than 74 per cent to the GDP during the late 1990s, these sectors accounted for only 38 per cent of the total employment in the country indicating a slow rate of adjustments in the labour market. The sectoral relocation of labour and mobility from unskilled to skilled labour require time and the adjustments in the labour market are less rapid than the adjustments in production.

The differences in growth between the sectoral output and the employment, however, have implications in terms of productivity (Table 10). Despite the growth in output particularly due to the introduction of high-yielding varieties (HYVs) of rice, the value added per worker in agriculture declined due to increase in the number of labourers who were forced to seek employment in the 'residual' agriculture sector mostly as unskilled workers. This shows that reduction in the 'surplus' labour and further growth in productivity through technological innovations are essential to increase the return per worker in agriculture. The industry (including manufacturing) sector registered increase in terms of value added per worker due to relatively slow growth in the manufacturing labour force. The services sector experienced a slow growth in labour productivity where the growth in value added was higher than the rate of inflow of new workers. The economy as a whole, however, experienced a decline in value added per worker during the period since the mid-1980s

Table 10

Trends in Value Added Per Worker in Major Sectors

	Index (1985/86 = 100)						Productivity Index		
	Value added			Employment			Value added per worker		
	1990/91	1995/96	1999/00	1990/91	1995/96	1999/00	1990/91	1995/96	1999/00
Agriculture	111	121	149	191	198	207	58.1	61.1	72.0
Industry	130	191	244	176	141	162	73.9	135.5	150.6
of which:									
Manufacturing	128	190	234	196	135	142	65.3	140.7	164.8
Services	120	151	183	110	158	169	109.1	95.6	108.3
Total	119	149	184	164	179	190	72.6	83.2	96.8

Source: BBS 2000, 2001.

3. External Sector and Export Performance

Since the 1970s, Bangladesh's external sector witnessed, relative to other sectors, more intensive reforms and policy changes. The country started with a restricted trade

regime and a reversal of the policy towards a liberalized external sector began in 1975.[14] The reforms emphasized on creating a liberal trade regime for greater integration of the domestic economy with the global economy to improve internal and external competitiveness and accelerate export-led growth.

3.1 Trade Policy Reforms

Over the last three decades, both tariff and non-tariff barriers were dismantled in Bangladesh as a part of its liberalization agenda. The reforms aimed to rationalize and simplify the trade regime by lowering the tariff rates, phasing out the quantitative restrictions, streamlining the import procedures, and introducing tax reforms.[15] Several major changes in the trade policies may be noted:

(i) The highest customs duty rate was reduced from 350 per cent in 1992 to 37.5 per cent in 2000. The mean tariff declined to 22 per cent in 1999 from 114 per cent in 1989 while the weighted mean tariff declined to 19 per cent from 114 per cent;

(ii) Four slabs of duty rates were introduced in 2000 in place of 24 in the 1980s;

(iii) The number of commodities under the four-digit code subject to quantitative restrictions declined from 550 in 1987 to 124 under the Import Policy of 1997-2002. In 1992, about 12 per cent of around 10,000 tariff lines were subject to restrictions which declined to less than 4 per cent in 1999. At present, less than 0.5 per cent of total imports, mainly in the textile category, are subject to quantitative restrictions; and

(iv) Tariff bands were narrowed down and import procedures simplified.

Different export promotion measures were also adopted to diversify the export base, improve the export quality and stimulate higher value added exports, and develop backward linkage industries. As a result, Bangladesh's global economic integration increased rapidly with the share of foreign trade (exports and imports) in GDP increasing to nearly 35 per cent in 2000 from around 20 per cent in the early 1980s.[16]

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[14] The inward looking policies of the period highlighted the concerns to conserve foreign exchange, create the industrial base through a protective domestic environment, and maintain a sustainable balance of payments. Strong arguments, however, were put forward against these policies on the ground that such policies had led to distorted incentive structures creating allocative and productive inefficiencies, external sector strains and anti-export bias, and slow growth paving the way to trade and other reforms.

[15] For instance, there were 36 different tariff rates in 1978 in the country extending to 400 per cent along with widespread quantitative restrictions.

[16] Other measures of global integration also support the contention. For instance, trade in goods as percentage of PPP GDP increased to 7.0 in 1998 from 4.2 in 1988 and trade in goods as percentage of goods GDP increased to 56.1 from 29.9 over the same period. See Mujeri 2002.

3.2 Changes in Trade Flows

At the aggregate level, the growth and structural changes in the merchandise trade can be seen in Table 11. Compared with an average annual growth of around 8 per cent in the 1980s, exports in both volume and value terms increased by 13 per cent in the 1990s. In the case of imports, the rates increased substantially to 9 per cent for volume and 12 per cent for value in the 1990s compared with less than 2 per cent for volume and 4 per cent for value in the 1980s.

Table 11

Growth and Structural Change in Bangladesh's Merchandise Trade

A. Growth				
		Average annual % growth		
		1980-1990		1990-1997
Exports				
	Volume	7.6		12.9
	Value	7.6		13.2
Imports				
	Volume	1.8		9.1
	Value	3.7		11.8
B. Structural Change				
		Merchandise exports		Merchandise Imports
		1980	1998	1980	1998
Total value ($ million)		793	5,141	2,353	6,862
			% of total		
Food		12	7	24	15
Agricultural raw materials		19	2	6	5
Fuels		0	0	9	7
Ores and metals		0	0	3	2
Manufactures		68	91	58	69

Source: World Bank 2000.

The trade basket indicates an increasing concentration of a broad category (e.g. manufactured goods) accounting for 91 per cent of total merchandise exports in 1998. The category consists of an assortment of simple manufactured goods e.g. readymade garments, leather and leather manufactures, fabrics, and made-up articles. The bulk of these exports consist of labour intensive commodities requiring unskilled labour. It is estimated that the share of skill-intensive goods (e.g. chemicals, electrical and non-electrical machinery, computers and office equipment, communication equipment and similar products) in Bangladesh's manufactured exports was only 4 per cent in 1996 (Mayer and Wood 2001).

This indicates that the country's exports increased through exporting more of same or similar goods.

The composition of exports also reveals extreme concentration in the exportable commodities (Table 12). In the early 1980s, more than 73 per cent of exports came from raw jute and jute goods while, in the late 1990s, the concentration shifted to readymade garments and knitwears accounting for 76 per cent of exports. This shows the extremely narrow base of the country's export sector with its structure largely explained by the average combination of existing human and natural resources.[17]

Table 12

Export Composition by Major Commodity Groups

	1979/80	1985/86	1990/91	1995/96	1999/00
Total exports ($ million)	710	917	1,718	3,884	5,752
			% of total exports		
Raw jute	19.9	15.2	6.1	2.3	1.3
Jute goods	53.2	36.2	16.8	8.5	4.6
Frozen foods	5.1	14.1	8.3	8.1	6.0
Tea	4.6	4.0	2.5	0.8	0.3
Leather	9.1	7.5	7.8	5.5	3.4
Readymade garments (including knitwears)	0.1	16.2	50.5	65.6	75.7
Others	8.0	6.8	8.0	9.2	8.7
Total	100	100	100	100	100

Source: BBS 2001, MOF 2001.

3.3 Trade Reforms and Labour Market Implications

With the reasonable assumption that Bangladesh is a labour abundant country, trade reforms can have significant implications on the labour market. As we have noted earlier, the employment pattern in the country is characterized by a low level of formal sector employment.[18] At the aggregate level, however, a deceleration in the rates of both

[17] Based on an analysis of the determinants of South Asia's export structure, Mayer and Wood conclude that Bangladesh's average export structure and export concentration in low-skill labour intensive products result mainly from a low level of education and few natural resources relative to its high labour supply. See Mayer and Wood 2001.

[18] It is estimated that only about 19 per cent of the employed persons (15 years and over) worked in the formal sector in 2000. The share of formal sector employment, however, is increasing over time. During 1996, the share was only 13 per cent. The changes occurred mainly in the private formal sector. The share of public formal sector remained nearly unchanged at around 4.5 per cent during 1996-2000 while the share of the private formal sector increased from about 9 per cent in 1996 to more than 14 per cent in 2000. See BBS, 1998, 2002.

employment creation and real wage changes can be associated with the period of trade reforms (Table 13). In fact, manufacturing employment declined at more than 6 per cent per year during the early 1990s indicating significant adjustments in the labour market, particularly in its formal segment. The rate of increase in real wages also decelerated across the entire economy during the post-reform period.

Table 13

Changes in Employment and Wage Rates

(Annual growth rate in %)

	Pre-reform: 1986-1991			Post-reform: 1991-1996		
	GDP	Employment	Real wages	GDP	Employment	Real wages
Total	4.4	2.8	2.5	5.3	1.8	1.3
Agriculture	2.8	2.2	3.2	2.2	0.3	1.9
Manufacturing	6.5	19.2	2.4	9.5	-6.2	1.6

Source: Mujeri 2002.

A disaggregated view of the manufacturing sector which was significantly affected by the reforms, however, shows the existence of contrasting trends. For examining the impact, we used the data for 22 broad manufacturing groups with average annual employment of more than 2,500 workers. The groups were divided into labour-intensive and non-labour intensive ones on the basis of employment intensity.[19] The changes in value added (at constant prices) during the pre-liberalization period (1985/86 to 1989/90) and the post-liberalization period (1990/91 to 1995/96) were compared. The results are given in Table 14. Out of a total of 12 labour-intensive industries, seven experienced a deceleration in growth in value added while six out of 10 non-labour intensive industries showed similar trends. The results indicate that the manufacturing groups which experienced positive impact largely derived benefits through better (and cheaper) access to imported imports while the negative effects emanated mostly from the competing imports due to liberalization.[20]

[19] The dividing line was set such that the labour-intensive industries require more than 10 person-year of employment per million Taka of value added in 1989/90.

[20] This is revealed, for example, by the fact that cheaper import of paper facilitated the growth of printing and publishing while paper and paper products experienced declining growth.

Table 14

Post-Liberalization Growth Trends by Broad Industrial Groups in Bangladesh

	Increasing growth	Declining growth
Labour intensive industries	(321-322) Manufacturing of Textiles (332) Furniture and Fixtures (Wooden) (381-382) Fabricated Metal Production (342) Printing and Publishing (383) Non-electrical Machinery	(323) Wearing Apparel except Footwear (331) Wood and Cork Products (369)Non-metallic Mineral Products (356) Rubber Products (311-312) Food Manufacturing (326) Ginning and Processing of Fibres (361) Pottery and China ware
Non-labour intensive industries	(353) Other Chemical Products (351) Drugs and Pharmaceuticals (314) Tobacco Manufacturing (325) Leather Footwear	(384) Electrical Machinery (341) Paper and Paper Products (324) Leather and Leather Products (385) Transport Equipment (357) Plastic Products (352) Industrial Chemicals

Note: The growth performance refers to percentage change in value added during 1990/91 to 1995/96 compared with 1985/86 to 1989/90. Figures in parentheses indicate BSIC code. For definition of labour intensive industries, see footnote 18.

Source: Mujeri 2002.

The above results indicate that the majority of the labour-intensive industries did not display any dynamism after trade liberalization suggesting that the overall industrial structure in Bangladesh is not driven by trade rather by the prospects within each of the relatively isolated industrial groups. In the absence of any integrated industrial structure, trade liberalization itself also had not led to any positive wage impact in the gaining sectors. In addition, a significant impact of tariff reduction was the exposure of many import-substituting industries to increased competition from imports resulting in closure of enterprises and loss in employment.[21]

While it is difficult to draw any firm conclusions regarding the impact of liberalization on the informal sector due to paucity of data, some evidence indicates mixed results. As noted earlier, the importance of nonfarm activities has been increasing in Bangladesh especially in rural areas. In 1997, 66 per cent of the earning members of the rural households were dependent on agriculture: 28 per cent in farming activities and 35 per cent as agricultural labour. Only 4 per cent were involved in other agriculture such as fishing or

[21] Although no reliable data are available, it is reported that many industrial units were forced out of business after trade liberalization due to competition, unfair business practices or border smuggling with India. See CPD 1997.

livestock raising as principal occupation (Table 15). The non-agricultural activities engaged 34 per cent of the rural households. These activities comprised petty trade, shop keeping and business, trade and transport, and other nonfarm activities. In the case of rural poor households, nearly 71 per cent were dependent on agriculture, of which 47 per cent worked as agricultural labour. The average monthly per capita income from non-agricultural activities was higher compared with agricultural occupations: 18 per cent for all rural households and 11 per cent for the poor households. The average per capita income of the poor households, however, is consistently low in both agricultural and non-agricultural occupations. This indicates that the poor are generally involved in low return nonfarm activities due to technical, financial, institutional and other market-related constraints. The above indicates that trade liberalization in Bangladesh in the face of inadequate production, consumption and labour market linkages could not lead to a sustained takeoff of the informal sector and generate adequate returns to the participants.

Table 15

Occupational Distribution of Rural Households, 1997

	All rural households		Rural poor households	
	Per cent of households	Average monthly per capita income (Tk.)	Per cent of households	Average monthly per capita income (Tk.)
A. Agriculture	65.9	655	70.7	389
Farmers	27.5	831	20.0	426
Agricultural labour	34.8	521	46.8	374
Other agriculture	3.6	611	3.9	383
B. Non-agriculture	34.1	744	29.3	431
Trade	11.5	764	9.1	424
Transport & trade workers	5.0	522	5.4	384
Other non-agriculture	11.6	853	14.8	453
Total	100	721	100	402

Source: BBS 1998.

The above analysis of the labour market in Bangladesh indicates that, despite substantial adjustments and the existence of surplus labour, the wage increase of the skilled workers were significantly higher than the unskilled workers since the 1980s leading to widening income (wage) inequality between the skilled and the unskilled labourers. Since

extensive liberalization of Bangladesh's external sector also took place during the same period, this indicates the likely existence of some association between observed increase in wage inequality during the period and the trade reform measures. However, trade reforms may not be the only factor that contributed to the widening of the wage gap of the period. On the contrary, wage and trade literature points to the existence of several other factors, which could explain a significant part of the changes in wage inequality other than the trade factors. In this paper, following Abrego and Whalley (2000) a double calibration general-equilibrium methodology has been used to decompose the observed inequality in wages generated by multiple sources into the components associated with each source. The method departs from the traditional applied general equilibrium exercise in two ways. First, it decomposes an observed (*ex post*) economic outcome into component influences; rather than computing *ex ante* counterfactual equilibria. The approach further recognizes the fact that these influences need not, and typically will not, be additive. Second, the analysis is based on a two-period rather than a single period calibration, since it requires model parameterizations to be as consistent as possible with changes over time, not just the base year observation.

More specifically, we have applied the technique to a component decomposition of the increased wage inequality between 1985 and 1996 in Bangladesh. The model and the techniques we present here suggest that, within a general equilibrium setting, other factors such as changes in factor supply and a wider variety of technical changes, also enter the picture and play a significant role, in explaining wage differentials between the skilled and the unskilled labour in Bangladesh.

4. The Methodology and the Model Structure

In order to operationlize the double calibration decomposition analysis for assessing the contribution of different factors underlying the observed wage inequality changes over the period, the model of a small, open price taking economy for Bangladesh has been specified. The model has been calibrated to the data for two years (1985 and 1996) using the Ricardo-Viner specific factors specification rather than the Hecksher-Ohlin-type fully mobile factors model specification. The use of the Ricardo-Viner specification as opposed to the Heckscher-Ohlin-specification in a similar exercise has been argued by Abrego and Whalley

(2000)[22]. In order to implement the methodology, Bangladesh's economic structure has been assumed to consist of two goods: agriculture and non-agriculture. For our purpose, we have assumed that agriculture is intensive in unskilled labour while non-agriculture is intensive in skilled labour. For the analysis, it is also assumed that agriculture is importable and non-agriculture is exportable (since more 70 per cent of the exports from Bangladesh are of manufacturing textiles of various types)

Production:

We consider Bangladesh as a small open price taking economy that produces two goods, M and E, both of which are traded at fixed world prices in period $t, P_{it}; i=M,E$. The production of each good in each period requires the use of two mobile factors: skilled labour, S, and unskilled labour U, and an unspecified sector specific fixed factor. Production, consumption and trade take place in each of the two time periods, 1 (1985) and 2 (1996), which are denoted as the initial and the terminal periods. Each good in each period is produced according to a decreasing return to scale technology:

$$Y_{it} = A_{it} L_{it}^{\alpha_{it}} \qquad \text{i=M,E; t=1,2} \qquad (1)$$

where, Y_{it} refers output of good i in period t, A_{it} denotes a sector specific measure of the efficiency of a composite labour factor input, and L_{it} is the use of a composite labour input. α_{it} is the output elasticity with respect to the composite labour.

[22] Abrego and Whalley argue that, "the attraction of Heckscher-Ohlin-type models has been that these provide a simple widely used analytical framework in which the relationship between relative wages and relative price changes is clearly defined. However, we do not use this model form because there are problems with its empirical implementation. One is that for convenient functional forms, the Heckscher-Ohlin model with homogeneous goods and constant returns to scale has problems in accommodating relatively large product price changes. Conventional Heckscher-Ohlin structures are also incapable of accommodating factor-biased technical change as a source of wage change for the small open economy case (Leamer, 1998; Krugman, 2000). One way of dealing with these difficulties is to abandon the assumption of homogeneous goods in preferences, and use an Armington-type structure. Although Armington models have been widely used in the applied general equilibrium literature, they are harder to work with analytically and hence no general results linking changes in relative prices with relative wages can be derived. A second approach consists of moving away from full mobility of all factors, and using a specific factors trade model (Ricardo-Viner) with decreasing returns to scale—a structure that has been more widely explored in the analytical literature of international trade (Jones, 1971; Samuelson, 1971; Mussa, 1974). We follow the second approach, modelling fixed factors in each sector, as well as two fully mobile factors (skilled and unskilled labour). This yields decreasing returns in each sector with respect to a composite of skilled and unskilled labour."

The composite labour input in each sector, L_{it}, is a CES aggregate of the unskilled and the skilled labour U and S,

$$L_{it} = \beta_{it}\left[\beta_{it}(\delta_{it}^{u} \cdot U_{it})^{(\rho_{it}-1)/\upsilon_{it}} + (1-\beta_{it})(\delta_{it}^{u} \cdot S_{it})^{(\rho_{it}-1)/\rho_{it}}\right]^{\frac{\rho_{it}}{\rho_{it}-1}} \qquad (2)$$

where, B_{it} defines the units of measurement for composite labour, and β_{it} is the CES share parameter in the aggregation function; δ_t^U and δ_t^S are factor–augmenting technical change parameters which capture changing input quality over time; ρ_{it} denotes the elasticity of substitution between $\delta_t^U U_{it}$ and $\delta_t^S S_{it}$. Combining equations (1) and (2) for each sector in each period, we have

$$Y_{it} = \gamma_{it}\left[\beta_{it}(\delta_{it}^{u} \cdot U_{it})^{(\rho_{it}-1)/\upsilon_{it}} + (1-\beta_{it})(\delta_{it}^{u} \cdot S_{it})^{(\rho_{it}-1)/\rho_{it}}\right]^{\frac{\alpha_{it}\rho_{it}}{\rho_{it}-1}} \qquad (3)$$

where, the units parameter in the consolidated function $\gamma_{it} = A_{it}B_{it}$. In equation (3), changes in γ_{it} represent sector-specific (Hicks-neutral) technical changes, while changes in δ_t^U and δ_t^S reflect factor-biased technical change. In the empirical implementation of the model, it is assumed that production of the importable good, M, is intensive in unskilled labour in both periods, i.e. $\beta_{Mt} > \beta_{Et} \forall t$.

Labour Market:

The labour markets are assumed to be competitive, so that each type of labour is paid its marginal value product, ensuring full employment in equilibrium of each type of labour in each period. The endowments of unskilled and skilled labour (i.e. U_t and S_t respectively) are assumed to be fixed in each time period but they vary across the two periods. The first order conditions for factor demands implied by the marginal product pricing are:

$$W_{ut} = P_{it}\alpha_{it}\beta_{it}\delta_{it}Y_{it}^{[\rho_{it}(\alpha_{it}-1)+1]/\alpha_{it}\rho_{it}}/U^{\rho_{it}\gamma^{(\alpha_{it}\rho_{it}/\rho_{it}-1)}} \qquad (4)$$

$$W_{st} = P_{it}\alpha_{it}(1-\beta_{it})\delta_{it}Y_{it}^{[\rho_{it}(\alpha_{it}-1)+1]/\alpha_{it}\rho_{it}}/S^{\rho_{it}\gamma^{(\alpha_{it}\rho_{it}/\rho_{it}-1)}} \qquad (5)$$

where, W_{ut} and W_{st} denote unskilled and skilled wage rates respectively, and P_u are the (fixed) world prices of goods in each period t. Given the decreasing returns technology set out in

equation (1), the payments to unskilled and skilled labour do not exhaust the value of production in either sector, and the remaining return implied by equation (1) accrues to the fixed factor in each sector.

Trade:

In equilibrium, a zero trade balance condition holds, i.e.,

$$\sum_{i=M,E} P_{it} T_{it} = 0 \qquad (6)$$

where, T_{it} denotes the net trades of the country in the two goods, M and E. The sign convention is that if good i is exported, domestic production less consumption is positive; if good i is imported this difference is negative. The imports and the competitive domestically produced goods are treated as homogeneous, as is also the case with exports (i.e. trade is of homogeneous goods). This homogeneity assumption implies that trade flows involving any good are always one-way, and that one of the goods is exported and the other imported.

Trade shocks are modeled in this framework in the form of changes in world prices, which, in turn, typically induce increased import volumes. A fall in the relative price of unskilled intensive to skill intensive goods between the initial and the terminal years is considered as a trade shock. These generate larger import volumes in the model resulting in adjustment out of the unskilled intensive sector and increases in exports.

Equilibrium Conditions:

Given the small open economy assumption underlying the model, goods markets do not clear domestically since imports and exports represent positive and negative excess demands. These are absorbed or met by world markets subject to the trade balance, with perfectly elastic demands and supplies at world prices. The equilibrium in each period in this model is thus given by the unskilled and the skilled wage rates such that the two domestic labour markets clear. The value of marginal product of each mobile factor in each sector is equal to the corresponding wage rate as in (4) and (5), and the implicit fixed factor in each sector i receives the residual in return, F_u, in period t. The market clearing conditions of this form hold in both periods, i.e.

$$\sum_i U_{it} = \overline{U_t}, \quad \text{i=M,E; t=1,2} \qquad (7)$$

$$\sum_i S_{it} = \overline{S_t}, \quad \text{i=M,E; t=1,2} \qquad (8)$$

In this model, the two market-clearing conditions (7) and (8) determine the skilled and unskilled wage rates that clear markets in mobile factors. The fixed factor in each sector receives the residual between the value of production at world prices and payments to factor inputs. This enters incomes which, in turn, finance goods demands.

The consumption of each good in equilibrium is given by the difference between production and net trade, i.e.

$$C_{it} = Y_{it} - T_{it}, \qquad \text{i=M,E; t=1,2} \qquad (9)$$

where, C_{it} denotes consumption of good i in period t.

A property of equilibrium in such a model (from Walras Law) is that trade balance will be satisfied.

5. Decomposition Simulation

The model calibrated in the techniques specified above has been used to obtain estimates of the contributions of augmented trade, factor biased technical change, and change in factor endowment to explain the increases in wage inequality in Bangladesh between 1985 and 1996. Trade shocks are captured by incorporating observed changes in world prices (the relative price of skill intensive to unskilled intensive goods). These changes influence flows of trade, which are determined endogenously in the model. More specifically, trade shocks have been specified in the model by incorporating the decline in the relative prices of the unskilled-intensive products (in our case, aggregated to *M*) that took place in Bangladesh between 1985 and 1996.

Over time, changes in factor-biased technology have been specified as changes in the factor-augmenting technical change parameters, that is δ_t^u and δ_t^s. Other forms of technical changes allowed by both the model and calibration procedures, as indicated earlier, have also been considered.

The decomposition experiments have been conducted using three double calibration procedures. The changes in model technology parameters over time have been specified using two-period data (i.e. 1985 and 1996). The derived parameter values are dependent on the specific procedures implemented.

In order to assess the contribution of each individual component to wage inequality, the equilibrium of period 1 (i.e. 1985) is considered as the base model solution. Once the base solution is achieved, the model in the first simulation is resolved by considering only the trade shock, and then in successive simulations, each of the technology parameters implied by the calibration procedure are altered to examine their contribution to wage inequality. Lastly, the impact of changes in factor supplied is simulated. The incorporation of all these changes together are consistent with observed wage inequality change, as well as all the other elements observed for the second period equilibrium (i.e. 1996). The contribution of each component to total change in wage inequality is then estimated.

It is important to note that the proportions of the total change calculated in this way need not (and typically will not) be additive. This is because each simulation experiment considers a change in only one of the three variables, and these variables have interacting effects, envisaging that their separate contributions to the total change generated by these experiments may sum to more or less than the observed wage inequality change.

6. Data base of the Decomposition Simulations

The decomposition simulations have been performed using the observed data of the Bangladesh economy for the two years, 1985 and 1996. The choice of these two periods have been dictated by the observed rise in wage inequality, increase in real GDP, and marked structural shifts in employment and value added. Moreover, the choice of these two years covers a period during which there was a significant decline in the wage of unskilled workers relative to their skilled counterparts. It can also be observed that, there was a significant increase in real GDP, a rise in the trade volume (imports) and opening up of the economy and a rise in the employment of unskilled labour compared to the skilled labour in different sectors during the period. The model described in the previous section has been numerically parameterized to apply the double calibration methods. The model has been fit to both initial and end of period observations using the double calibration procedures.

Table 26

Bangladesh Data Relevant to Wage Inequality Change between 1985 and 1996

	1985	1996
Unskilled to skilled labour wage ratio	0.88	0.69
Import to GDP ratio for unskilled-intensive products	0.02	0.06
Employment in skilled-intensive sector (%)	9.8	7.5

Source: Author's calculations.

Given the model structure, all production activities were aggregated into two broad sectoral groups of skilled-intensive (i.e. mainly manufacturing and those located in urban settings) and unskilled-intensive sectors (i.e. mainly agriculture and those located in rural areas). With regard to the factor market specification, four factors of production such as skilled labour, unskilled labour, and the specific factor (capital) in each of the two sectors were used. The sectoral employment of skilled and unskilled workers was estimated using the information from the Labour Force Survey and the SAM for 1995/96. On the other hand, the information on sectoral production, factor income (labour and capital) and imports and exports were derived from the Social Accounting Matrixes of 1984/85 and 1995/96.

The information from the Labour Force Surveys and other sources have been used to calculate the change in relative wage rates over the period 1985 to 1996. The observed 10 percent fall in the relative price of the unskilled intensive good in the international market faced by the Bangladeshi producers has been used to capture the trade shock experienced by Bangladesh over the period 1985 to 1996.

In calibrating the model, data have been adjusted such that the terminal year (i.e. 1996) reflects the observed relative price and wage changes in real terms. The changes in the value of sector output experienced over the period have similarly been adjusted. These information have been employed to parameterize the model. Table 17 presents the 1985 and 1996 model parameters implied by each of the calibration procedures that we have used along with the changes between equilibria and other information used in the decomposition experiments.

Table 17

Values of Parameters, Elasticity, Relative Prices and Endowments in 1985 and 1996

(per cent)

Parameters		Simulation 1			Simulation 2			Simulation 3		
		1985	1996	Change	1985	1996	Change	1985	1996	Change
Factor Augmenting Technology	δ^U	1.00	1.10	10.0	1.00	1.00	0.00	1.00	0.75	-25.0
Factor Augmenting Technology	δ^S	1.00	1.55	55.0	1.00	1.00	0.00	1.00	1.75	25.0
CES Parameters	β_M	0.57	0.44	-23.0	0.57	0.42	-26.3	0.57	0.57	0.0
CES Parameters	β_E	0.46	0.38	-17.4	0.46	0.36	-21.7	0.46	0.46	0.0
Sector Specific Technology	γ_M	6.92	6.92	0.0	6.92	10.5	52.2	6.92	10.5	52.2
Sector Specific Technology	γ_E	6.03	6.03	0.0	6.03	12.9	113.9	6.03	12.9	113.9
Output Elasticity	α_M	0.59	0.65	10.2	0.59	0.65	10.2	0.59	0.65	10.2
Output Elasticity	α_E	0.57	0.59	3.5	0.57	0.59	3.5	0.57	0.59	3.5
Terms of Trade	P_M/P_E	1.00	0.90	-10.0	1.00	0.90	-10.0	1.00	0.90	-10.0
Factor supply	U	1.00	0.85	-15.0	1.00	0.85	-15.0	1.00	0.85	-15.0
Factor supply	S	1.00	1.15	15.0	1.00	1.15	15.0	1.00	1.15	15.0
Substitution Elasticity	ρ_{itt}	1.25	1.25	0.0	1.25	1.25	0.0	1.25	1.25	0.0

7. Simulation Outcomes

The simulation results of the decomposition of wage inequality in Bangladesh using the double calibration method are presented in this section. More specifically, the decomposition experiment has been performed using three double calibrations. In each case, decomposition exercises have been conducted separately to evaluate the influences of trade, technology and endowments on observed relative wage change in Bangladesh between 1985 and 1996. In these experiments, we have considered changes between 1985 and 1996 in the relative goods prices, factor endowments or factor supply, and the output elasticity of composite labour input, α_{it}.

The results of the decomposition experiments are presented in Table 18. The assumption underlying the first simulation was that the technical change was factor-biased and hence no Hicks-neutral technical (i.e. sectoral) change occurred during the time (i.e. between 1985 and 1996). Contrary to the first simulation, the assumption of factor-biased technical change was dropped and Hicks-neutral change was incorporated in the second simulation. In both these simulation experiments, the production function parameter β_{it} (the share of unskilled labour in production) in each sector varied over time. The third simulation allowed for both factor-biased and Hicks-neutral technical change, but β_{it} was held constant over time.

All the simulations were performed alternatively by introducing the changes specified in the first column of Table 18 into the base period (i.e. 1985) specification of the model. When changes in exogenous variables (such as changes in world prices which generate more trade) across periods are made, the decomposition results depict that the importance of the factor remains the same, independently of the calibration procedure employed. However, when changes refer to the calibrated parameters (as with the factor-biased technical change), then the results vary with the calibration method used.

From the results, it is interesting to note the relatively small contribution of trade in explaining the rise in wage inequality between 1985 and 1996. The contributions of trade to wage inequality have been found to be 2.3 percent, 3.4 percent and 3.6 percent respectively under the first, second and the third simulations. Large contributions have, however, been recorded for the factor-biased technical change (e.g. in simulations 1 and 3), which, in turn, vary significantly depending upon the calibration procedure used. The contributions of the

factor-biased technical change in explaining wage inequality increase account for 16 per cent and 35 per cent under the first and the third simulations. The finding suggests that when changes in share parameters, β_{it}, are not allowed, the factor-biased technical change accounts for more than the observed wage inequality change. The changes in factor supply also have large negative effects on rises in wage inequality, but these are offset by the positive effects of changes in share parameters in the first and the second simulations and by the factor-biased technical change in the third simulation.

In the first simulation, changes in the factor-biased technology accounts for 16 per cent of the relative wage change. However, this is accompanied by a larger impact (than the factor-biased impacts) offsetting the negative and positive influences due to changes in β_{it} and factor supplies. The contribution of the factor-biased technical change is more than twice the observed change in wage inequality under the third simulation compared to the first simulation. In this case also the impacts are offset by the opposite effect generated by the relative increase in the endowment of unskilled labour factor. In all simulations, the impact of factor-biased technical change on wage inequality has been marginally offset by the changes in the parameter α_{it}. The results from the first and the third simulations envisage that the factor endowment change is a more significant factor behind increased wage inequality than trade[23]. Under the second simulation, the increase in wage inequality has been accounted for mainly by the changes in β_{it} and the Hicks-neutral technical changes when the influence of the factor-biased technical change is dropped[24].

Table 18

Decomposition of Wage Inequality in Bangladesh: 1985 to 1996

Contributing Factors	Experiments		
	First	Second	Third
Increased trade	-2.25	-3.38	-3.60
Factor-biased technical change	-15.80	0	-34.79
Hicks-neutral technical change	0	42.58	-40.39
Factor endowment changes	48.25	34.15	54.13
Changes in β_{it}	-37.39	-40.62	0
Changes in α_{it}	2.48	1.67	1.59

[23] This finding is in line with the trade and wages literature where the contribution of skilled-biased technical change has been recognized as a more significant factor behind increased wage inequality than trade.

[24] As in the third simulation, these findings point to a smaller role for Hicks-neutral technical change, although changes in β_{it} cannot be interpreted as technical change in a conventional sense.

8. Concluding Observation

The present study examines the sources of increased wage inequality between skilled and unskilled labour in Bangladesh between 1985 and 1996 using a general equilibrium framework. For the purpose, a double calibration technique was used by fitting the model to the data for both the initial and the terminal years to measure the influences of different factors that jointly contributed to the observed changes in wage inequality during the period. The application of the methodology allowed us to examine the relative contribution of several major sources of increased wage inequality like trade, technology and changes in factor endowments.

The results of our analysis suggest that the factor-biased technical change has been the major contributory factor in increasing the wage inequality between 1985 and 1996 in Bangladesh. The contribution of trade in increased wage inequality was relatively small. Moreover, the changes in factor endowments had a significant role in determining the net outcomes in wage inequality during the period. The general conclusion that emerges from the decomposition analysis indicates that skill-biased technical change is the significant determinant of wage inequality in Bangladesh. Trade liberalization and the development process in general leads to higher demand for skilled labour (which is the relatively scarce labour factor) than the abundant unskilled labour in Bangladesh. As a result, the wages of skilled labour increase at a faster rate than the unskilled wages leading to widened wage disparity. The process has significant poverty implications since the unskilled workers in the rural areas form the largest majority of the poor in Bangladesh. In view of the relative abundance of unskilled labour and the existence of significant imperfections in the labour market, Bangladesh's pro-poor development agenda needs to focus on providing education and upgrading the skill level of the labour force which is likely to reduce the 'wage divide' between the skilled and the unskilled labour with consequent positive income effect on the poor. For the purpose, policy measures are needed to increase the supply of skilled labour in the country since higher growth and associated technological change may not necessarily lead to enhanced supply of skilled labour on its own which would result in increased wage inequality between the skilled and the unskilled labour as observed in the present study.[25]

[25] For an exposition of the argument that higher rates of technological change and growth may be accompanied by higher relative wages but lower relative supply of skilled labour, see Eicher 1996.

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